

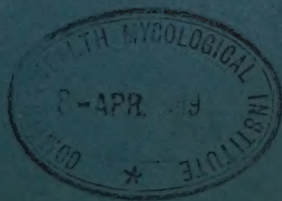


The
Imperial Forestry Institute
University of Oxford

TWENTY-FOURTH ANNUAL REPORT
1947—48

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UNIVERSITY OF OXFORD

TWENTY-FOURTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE ACADEMIC YEAR, 1947-48

THE numbers of students reading at the Institute showed a considerable increase. Under the special arrangements made for ex-Service students, 20 of them who had the required qualification in physical science (mainly the Preliminary Examination in Physics and Chemistry, or its equivalent) and had been reading Botany and Geology for 4 terms, were admitted to the Honour School course in the Hilary Term, having received some elementary instruction in silviculture and practical forestry during the Michaelmas Term. There were ten candidates in the final year for the Honour School, all of whom qualified, two with Class I Honours, two with Class II, and six with Class III. Two were from New Zealand, one from S. Rhodesia, and one from India, and all these four have found posts in their own countries; one other has been appointed to the Colonial Forestry Service and posted to Uganda. A Colonial Forestry Scholar returned from Malaya for his final year.

There were only four graduate Colonial Forestry Scholars, one of them from New Zealand, and three from Britain (Oxford, Cambridge and London Universities), and on completion of their first year at the Institute have been posted to Malaya, Kenya, British Guiana and Nyasaland respectively.

The Colonial Forest Officers' course was attended by 18 Officers and Probationers from the Gold Coast (5), Nigeria (4), Sierra Leone (2), Kenya (1), Uganda (1), Malaya (2), Borneo (1), Palestine (1), Trinidad (1).

The Indian Forest Officers' two-term course was attended by four officers from the new India, deputed by the United Provinces, East Punjab, Eastern States and Hyderabad. One officer expected from Pakistan had to postpone his arrival till the following year.

There were three students for the post-graduate Diploma, one of them continuing work on his special subject of the previous year's Indian course. Diplomas were awarded on the following subjects:

Soil Stabilisation.

Natural Regeneration of *Pinus sylvestris*.

The factors governing the occurrence and growth of Ash seedlings.

One student was working on a mycological problem for a B.Sc. thesis and one thesis dealing with the effect of competition with grasses on the growth of trees was approved for the B.Sc.

The Professor gave a course on Colonial Forestry to the Colonial Civil Service Cadets at Oxford University and also at Cambridge and he also conducted seminars in Land Utilisation subjects at the former.

The Continental instructional tours included a first visit to Holland by the Professor with twenty-one senior students. The junior year students made the usual tour in Normandy and the Landes. Two senior parties visited the Jura (17) and Vosges (18) respectively, and then crossed into Switzerland on independent programmes. Owing to the large numbers of students and the varied nature of the objectives five members of the staff conducted various parts of these tours. Dr. Anderson made a special tour in Belgium in connection with his special study under a grant from the Carpenters' Company of London, to examine the organisation of private forestry; at the same time he was looking into the suitability of the forests for instructional tours and it has been planned to make such a tour in 1949. In all four countries, we received most generous help from the Forest Services, individual forest officers and others whose forests were visited: we also again had the valuable help of M. Hubault in connection with the French tours. The summer tours finished at Zurich where our parties were given a much appreciated welcome by the Forest College and Research Institute. Another conducted tour made for the first time was to North Italy. A very instructive 10-day programme was kindly arranged by Professor Pavari of the Stazione Sperimentali di Selvicoltura, Florence, and Colonel Lloyd took the Indian Officers' class, mainly studying counter erosion and reclamation work.

Working plan field work was again done in the High Meadow Woods, Gloucester, with the permission of the Forestry Commission. This is the last year we expect to be working in this area, as from next year it has been arranged that we shall move to the New Forest where accommodation for students has been made available at Notherwood House.

The ten-day Utilisation course at the Forest Products Research Laboratory, at Princes Risborough, was repeated again during the Christmas vacation. As in previous years, the Institute is greatly indebted to the Director and his staff for the facilities and help given in connection with this course and other requests arising from the needs of individuals studying Utilisation subjects.

More and more of the students are following the advice given them to get practical experience of forestry during vacations and every help is given in finding suitable employment. Practical work was arranged with the Forestry Commission for 15 first-year students in the Cheviots, at Thetford and in North Wales. One student carried out practical forestry work during the Long Vacation in New Brunswick, Canada, where arrangements were kindly made by the New Brunswick Forestry School. Six students worked in the forests and sawmills in Norway on the invitation of the owners. Ten other

students worked on private estates in England and in Ireland. Practical work of this kind is invaluable to our first-year men. They work for the same number of hours and for the same wages as an ordinary woodman, and it brings them into direct contact with foresters and foremen in the woods.

The following day excursions were made with senior students during the summer term: Imperial Institute, London, the British Railways' sawmills and timber yards, Swindon; aerial photography interpretation at Elstree; Alice Holt Woods, Farnham; Messrs. J. Gliksten and Son's Sawmills, Stratford, London; Windsor Great Park; Hazelborough Woods; the Duke of Bedford's Woburn Abbey Estate, Bucks.

The junior year visited local woods mainly to study silvicultural problems. The places selected were Wytham Woods, Stanton St. John's, Temple Guiting, Wychwood Forest, Althorp Estate (the Earl of Spencer, Northampton), Whitchurch, near Reading, Great Missenden, Bucks, and woods in the Cotswold area.

Our thanks are tendered to all who kindly gave facilities for these useful visits.

Weekly discussions were continued on the lines that have been worked out during the past two years, but towards the end of the year it was decided that as practical experience is required before a student can take a full part in them, it was desirable to make different arrangements for undergraduates in their final year. The object remains the same, *viz.* to give all students the opportunity to benefit from the special knowledge of the others, and at the same time some experience in the public presentation of technical papers.

The tutorial arrangements made last year with Colleges was continued with satisfactory results. There were the usual difficulties with some of the graduate students unfamiliar with Oxford in deciding the branch or branches of forestry to which they should give special attention, and in accustoming themselves to work with general guidance rather than continuous instruction; this trouble was somewhat reduced by requiring arrival at the Institute well before the beginning of term.

It can be claimed that the index section of the Library has caught up with the arrears that accumulated during the war period, and through the co-operative arrangements with what is now the Commonwealth Forestry Bureau is keeping well abreast with the flow of current literature. The contemplated extension of the Bureau's activities further into the Forest Products and Industry part of the field will be of considerable benefit to the Institute. Another matter of common interest was the first post-war meeting of the Bibliographical Committee of the International Union of Forest Research Organisations at Zurich during the summer of 1948. The Director of the Commonwealth Forestry Bureau attended and presented constructive proposals but reported that very little was accomplished owing to uncertainty as to future relations with the United Nations Food and Agriculture Organisation.

Wytham Woods. Dr. Anderson continued the field work for the working plan but owing to the heavy teaching work of the year was unable to complete it. Meanwhile the current management of the woods has made steady progress under Colonel Lloyd's supervision as Executive Officer. Casualties in the last two years' plantations of 38 acres were replaced and a further 18 acres fenced and planted up largely with broadleaved trees. The nursery was maintained and produced a good deal of the stock required as well as serving for research purposes. The forester, Mr. H. Probitts, has done excellent work, and notwithstanding difficulties in finding housing and securing reliable woodmen, we now have three who seem likely to be suitable for permanent employment. Sales of dead standing trees with some inferior green trees on the planting areas realised £250 whilst the sale of fuel worked out when conditions were unfavourable for other work, brought in an additional £40. The Chalet has been leased for use as a field laboratory for the six biological departments interested and a resident caretaker installed.

Bagley Wood is more easily accessible and has at present a wider range of woods than Wytham, so it continues to be most valuable for instructional work. We are greatly indebted to St. John's College for continued permission to use the wood, as indeed we have used it ever since the School of Forestry opened in 1905. The modernisation including electrification of the sawmill is an important improvement made during the year. Mr. Gray, Research Forester of the Forestry Commission in charge of Kennington Nursery was again of great assistance to us.

In addition to the instructional tours, several members of the staff visited various countries in connection with their own fields of work. Mr. Brenan, Forest Botanist, made an extensive tour in Northern Rhodesia and the adjoining countries, collecting herbarium material and information for the check lists of trees, etc: he then crossed the continent to Nigeria and joined a botanical expedition led by Dr. P. W. Richards of Cambridge University, Dr. E. W. Jones being also a member of the party. Mr. Day accompanied the student party to Holland and visited the institutions concerned with phytopathology. After the end of the year, Mr. G. W. Dimbleby represented the Institute at a meeting of the International Union of Forest Research Organisations at which important changes in the constitution were discussed. Mr. F. C. Ford-Robertson, Director of the Commonwealth Forestry Bureau also attended the meeting, acting as alternate to the Professor on the Bibliography Committee. Unfortunately, very few decisions were reached owing to the pending constitutional changes.

The Professor accepted an invitation of the Elmhirst Trustees to go with Mr. W. E. Hiley to the West Coast of North America during the summer of 1948 to report on recent developments in general forestry and new experience with the trees extensively used for afforestation in Britain, notably Douglas fir, Sitka spruce and Western hemlock.

Research work on ecological problems, notably those presented by the extensive moorland afforestation being carried out by the Forestry Commission continues satisfactorily. The Field Laboratory at Birchall Camp near Wykeham and Broxa Forests was finally equipped and available for use from the spring of 1948 and a good deal of time has been spent there by all the staff concerned. The Laboratory is most valuable for preliminary work on material collected for examination on the afforestation areas, though most of the more detailed studies require the fuller facilities only available at Oxford. Fuller particulars are given later in this report but it is felt that useful progress has been made.

Various members of the staff took part in meetings of scientific societies concerned with their field of work and contacts with forestry practice were maintained by service on special committees with the Forestry Commission (Research and Regional Advisory Committees), Empire Forestry Association and the Royal Forestry Society of England and Wales, etc. The Professor and Mr. N. V. Brasnett continued to serve on the Committees respectively.

Once again the Institute has participated in Forestry Exhibits at the larger Agricultural Shows, *viz.* the Bath and West at Cardiff, the Three Counties at Gloucester, and the Royal at York.

Progress on the new building has been much as expected and the date of occupation is now put at October, 1949. Some of the donated timber has arrived in this country but no woodwork had been done before the end of the year under report, and it will be some time before these gifts are converted into flooring, panelling and furniture. A great deal of work has fallen on Dr. Chalk in arranging for the delivery of these special supplies from all parts of the world and in working out the details necessary for using them to best advantage. Similarly, Dr. Handley has undertaken the vast amount of detailed planning involved in the arrangements for the supply of light, heat and power to the laboratories and the building generally.

Pending completion of the new Institute the pressure on space has become even greater and has been such that the computer has been crowded out altogether; though fortunately a place to work has been found in the Institute of Social Medicine, thanks to the kindness of the Director.

One of the most serious deficiencies continues to be the lack of adequate seating space in the Library and elsewhere for reading and any suitable place for meetings and discussions. The Institute staff and students are much indebted to the Colonial Services Club for their courtesy in granting the use of their premises for various gatherings on several occasions.

The general increase in numbers of students and in research has put a premium on willing and efficient work by the technical assistants of all categories and the Institute is fortunate in having collected a number of very keen and competent helpers. The Head Laboratory

Assistant, Mr. F. H. Jones has fully justified his appointment and has done much good work especially in connection with the equipment of the workshop.

In the same way the secretarial staff has had greatly increased work to deal with and it is most creditable to the Secretary and Assistant Secretary that they have met the occasion so well that an improvement rather than a drop in efficiency can be recorded. The services of an Accountant, Mr. A. A. Adams from the University Chest, taking most of the weight of the accounts work from the Secretarial staff has been a potent factor.

SILVICULTURE

Dr. E. W. Jones was absent during the latter half of the Michaelmas Term and all Hilary Term on a visit to S. Nigeria and the Cameroons as a member of a Botanical Expedition organised by Dr. P. W. Richards of Cambridge University. Dr. Anderson carried on the normal courses of teaching during the period. The main object of the Expedition was to study the structure of the tropical rain forest on a more extensive scale than has hitherto been done with special reference to its natural regeneration and any evidence bearing on the mode of distribution of the major tree species. The detailed studies were made in selected examples of forest near Benin and in the Cameroons, both lowland and high montane. It will be some time before the results are worked up, but the tropical experience gained by Dr. Jones will be of immediate value to the Institute.

ECOLOGY

Mr. G. W. Dimbleby has continued the ecological studies initiated last year on the North-East Yorkshire Moors, and found clear indications that the establishment of a forest with a good type of forest soil should be possible, given correct ecological and silvicultural treatments, in particular the use of non-coniferous species as improvers of the highly degraded moorland soil. Birch is the obvious species for this purpose, and as it is a natural pioneer on these moors, a special study has been made of its natural regeneration. This has led to a more complete understanding of its method of establishment on these difficult sites. The observed ability of birch to penetrate the hardpan and exploit the subsoil, not so far recognised in any other species, renders it of particular value. There is evidence that birch litter will, in the course of time, bring about the 'humification' of *Calluna* raw humus. A field experiment to test the efficacy of birch litter as an agent of soil improvement over a number of years is being started this autumn (1948).

Studies have also been made of the natural regeneration of pine on these moorlands. The role of fire as a necessary precursor of seedling establishment was apparent, its critical effect being most likely the destruction of the heather cover, and elimination of competition. The falling-off in the regeneration as the heather returns has

been convincingly demonstrated. A detailed study of the respective tolerance of pine and heather to aeration and water conditions in the soil would seem from the ecological evidence to be a very promising line of enquiry.

The programme for the immediate future will be centred around the behaviour of birch, in its early stages of development, as all the scientific evidence points to the necessity of using this species, at any rate as a component of mixtures, if sound forestry is to be practised on the severely degraded soils of this and similar areas.

Dr. L. Leyton has continued his investigations into the relationship between certain edaphic factors and the mineral nutrient status of a number of tree species. Together with aeration experiments, studies have been made on the effect of pH on nutrient absorption by birch and Scots pine seedlings. These laboratory experiments will form the basis for investigations to be carried out later in the field. Further data have been collected concerning the relationship between tree growth and the mineral status of the tree, as reflected in the composition of the foliage. Corresponding analyses have also been made on the soils in an attempt to determine the relative importance of edaphic variations as compared with species variations. A general review of the subject of mineral nutrient relationships in forest trees was published in *Forestry Abstracts*, Vol. 9, pt. 4. Some work on Norway spruce has been carried out by a research student and the results suggest some interesting correlations particularly between height growth and phosphorous content of the needles. It would appear from preliminary experiments that the technique of determining the nutrient status of a naturally occurring herbaceous vegetation might be used successfully to forecast the availability of mineral nutrients to certain tree species on the same sites. This approach is being investigated by another research student.

In view of the increasing number of analyses which are involved in these experiments, various techniques have been tried to facilitate the routine estimation of mineral nutrients. A flame photometer has been constructed and this new method has now been successfully adopted for the determination of Calcium and Potassium in tissue and soil extracts.

In the microbiological field, Dr. W. R. C. Handley continued his investigation of the processes involved in infection of tree roots by mycorrhizal fungi.

The investigation of the effect of hop waste compost on *Calluna* raw humus has led to consideration of the more fundamental problem of the dynamic equilibrium between 'mull' and 'mor'. The problems involved are being attacked in a number of ways including the use of soil metabolism methods. These studies should have a direct link with the ecological studies.

The work is hampered by lack of accommodation, both from the point of view of absence of facilities and also from the point of view of assistance from postgraduate students and other research workers.

During the year visits to moorland afforestation experiments have been arranged for Professor E. Björkman of the Kungl. Skogshogskolan in Stockholm and Dr. E. C. L. Løfting of the Statens Forstlige Forsøgsvaesen in Denmark.

SOIL SCIENCE

The usual courses were given by Mr. C. G. T. Morison and Mr. G. R. Clarke of the Soil Science Laboratory and with assistance in field application by the Institute Staff. A good deal of attention has been given during the year to a revision of the programme of work to ensure closer co-ordination of the teaching in this subject to the theoretical and practical aspects of forestry, particularly in the ecological and silvicultural aspects.

Mr. P. J. Rennie has been engaged on a general survey of the soils of Allerston Forest area from the physico-chemical point of view, with attention focussed on the extensive plateau hills of Hackness and Wykeham Low Moors which exhibit some of the most severe inhibitory conditions for early tree growth, and a range of vegetation from the *Calluna-Erica* heath to close tree canopy.

The principal physical and chemical factors operative in the transition from heath to tree canopy as achieved by varying silvicultural practices, have been studied. By utilising the existing experimental material, together with a longer term ploughing and vegetation control experiment, it is hoped that resolution and assessment of the interacting effects of cultivation and of vegetation will be possible.

These studies are directed towards:

- (1) Soil-water relations, including precipitation, evaporation and transpiration, infiltration and run off.
- (2) Soil-Air-Water relation, quantitative aspects.
- (3) Soil-Air-Water relations with reference to humus type and properties.
- (4) Chemical characteristics of soil profiles. Wherever possible soil site characteristics are being supplemented with data on the vegetation and litter.

Mr. Rennie attended the Summer Conference of the British Soil Science Society at the School of Agriculture, Cambridge, meeting there many workers in related fields. He also visited the Macaulay Institute for Soil, discussing research work and problems with Drs. S. K. Fraser and J. J. Ovington. The opportunity was taken of seeing the Culbin Forest Area.

Similar contacts were made at Rothamsted and East Malling Experimental Stations, and Wye College.

Mr. Murphy's soil faunal investigations during the past season have been concerned principally with a rather intensive sampling of the surface layers of small heathland areas in the Allerston district in Yorkshire. A technique has been developed for dealing simultaneously with large numbers of samples, using a modified Berlese funnel

apparatus. A satisfactory method of collecting the samples in a suitable condition has also had to be worked out.

Sampling has been concentrated on three site types, *viz.* (a) Undisturbed heathland, (b) Cultivated heathland recently planted with Sitka spruce, (c) Cultivated heathland in which the Sitka spruce is reaching canopy.

For correlation with faunal population figures, the nature of the vegetative cover and soil profile characteristics have been recorded for each, together with the data of soil moisture, soil temperature, rainfall and air temperature.

Laboratory work has centred principally on devices for hastening the qualitative and quantitative examination of the faunal population after extraction. The problem has been partially solved by the use of a small pipette mechanically operated and mounted so that it remains in the field of view and at the same time is sufficiently flexible to be capable of movement with that field.

In addition Mr. Murphy has assisted in the initiation of an experiment on the Broxa area. This experiment which covers an area of approximately eight acres has been designed in an effort to isolate and assess the effect of vegetative cover (predominantly *Calluna*) and of cultivation, on tree growth. This heathland site, at present in its natural condition, has been intensively sampled during the summer months. Later cultivation and vegetation suppression treatments will be applied to be followed by planting with Sitka spruce. Sampling will continue after application of these treatments to determine any changes in faunal population which may take place. These results will be integrated with those obtained from similar sites where trees have been grown for a number of years.

FOREST BOTANY

The Forest Herbarium remains in the Institute though administratively part of the Department of Botany.

Mr. Hoyle continued as Curator, teaching and demonstrating in Systematic Botany and Tropical Ecology to Forestry students. For some four months (December—March) he was working in the Anglo-Egyptian Sudan, continuing the study of soils and vegetation there in collaboration with Mr. C. G. T. Morison and Mrs. B. I. Wright of the Soil Science Laboratory and members of the Sudan Research Division. During Hilary Term Mr. P. G. Beak of the Commonwealth Forestry Bureau helped with supervision while Mr. Hoyle was away.

Mr. H. L. Dunkley, Senior Assistant in the Section almost since its formation, resigned to take up another post during the Summer Vacation, 1947. Mr. A. Corney was appointed in his place in November.

The increase in herbarium accessions noted last year was maintained and further increased to 3,474 specimens during the year, mainly from the Forest Departments in Nigeria, Tanganyika,

Uganda, S. Rhodesia, Gold Coast, Bechuanaland and the Sudan. Other major contributions were the collections by Messrs. Brennan, Greenway and Keay in Rhodesia and Tanganyika, and by Mrs. B. I. Wright and Mr. Hoyle in the Sudan. Duplicate collections were also received from the Department of Agriculture, Pretoria, S. Africa and the Government Herbarium, Salisbury, Rhodesia. Wood specimens, mostly correlated, totalling 106, were handed to the Wood Structure Section.

Mr. Hoyle continued writing up his study of the genus *Brachystegia* and naming numerous specimens of the genus from various sources. Large and small collections borrowed from other herbaria for this study were partly dealt with and returned. The collections made in the Sudan by Mrs. B. I. Wright and Mr. Hoyle were sorted and partly named.

A paper on Tropical Soil-Vegetation Catenas and mosaics, embodying the results of collaboration with Mr. Morison and Dr. Hope-Simpson in the Sudan in 1938-39, was published in the July 1948 number of the *Journal of Ecology*.

During most of the academic year under review Mr. J. P. M. Brennan was absent on duty in Tropical Africa, having left England on July 10, 1947 and returning on May 3, 1948. From August 3 to November 22, 1947 he was in East Africa (N. Rhodesia and Tanganyika) and from December 2, 1947 to April 20, 1948, in Nigeria and the British Cameroons with the Cambridge Botanical Expedition.

The main purpose in N. Rhodesia was to examine the vegetation and to collect specimens and information that might be of use for future work on the forest flora of that colony. The principle areas investigated were the Livingstone—Victoria Falls region, Katombora, Barotseland (Machili and Katima Molilo regions), the lower part of the Luangwa River valley, Mumbwa, Broken Hill, the Copperbelt, Solwezi, Lake Bangweolo, Kawambwa to Mporokoso, and Abercorn. While at Livingstone several days were spent in examining and identifying specimens in the Forestry Department Herbarium. For the first fortnight Mr. Brennan was accompanied by a former student at the Institute, Mr. R. W. J. Keay, A.C.F., Nigeria, who enthusiastically devoted part of his leave to the tour and for the remainder of the time by Mr. P. J. Greenway, Systematic Botanist, East African Agricultural Research Institute, Amani, for whose kindness and help very grateful thanks are due. Acknowledgement must also be made of the invaluable assistance and kindly hospitality given by the Forestry Department, and also by other officials with whom contact was made during this journey.

After October 22, 1947 Mr. Brennan travelled with Mr. Greenway to Amani across Tanganyika Territory, via Mbeya, Mufindi, Iringa, Morogoro, Korogwe, and the W. Usambaras. There were opportunities of studying the forest flora at various points along this route and the comparison with N. Rhodesia was most instructive. The period between the 9 and 22 November was spent at Amani (with a

short journey to Tanga), and the opportunity was taken to do a good deal of work in the Herbarium there and to visit various forest areas in the E. Usambaras. It is a pleasure to mention the facilities given and kindness shown by the Acting Director and staff of the East African Agricultural Research Institute.

During the whole of the journey in N. Rhodesia and Tanganyika about 760 numbers of herbarium specimens, mostly represented by 5-6 sets, were collected by Mr. Brenan; several hundred of these are correlated with additional material in spirit, and some with wood specimens.

After leaving Amani, Mr. Brenan travelled by air from Tanga in Tanganyika Territory to Lagos in Nigeria. On the way, at Elisabethville, Belgian Congo, a visit was paid to the headquarters of the Comité Spécial du Katanga, who control the forestry in that region.

While in Nigeria Mr. Brenan was mainly concerned with the collection and identification of material.

On the return journey to Europe a short visit was paid to the Forestry Department Headquarters at Freetown, Sierra Leone, and to the forest in the mountains above the town.

Since his return to England, he has identified about 500-600 Nigerian specimens, and about 200 from Tanganyika, besides smaller collections from N. Rhodesia and Uganda.

The Tanganyika Check-list has been going through the press and should be published before the end of the present year. Three papers have been published and others on woody plants of East and South Tropical Africa await publication.

At the end of the year Mr. Brenan resigned his appointment to join the staff of the Kew Herbarium. An arrangement was made with the Director that whilst at Kew he should complete the work on the N. Rhodesian forest flora for which the Institute had sent him to that country.

Mr. Brenan was succeeded, after the end of the year, by Mr. F. White from Cambridge University.

FOREST PATHOLOGY

Mr. W. R. Day continued in charge of the section with Mr. F. H. Jones as senior assistant and Mr. D. Barrett and Miss D. Twist as junior assistants.

Research.

(a) *Root disease and butt-rot of conifers.* Further cases of root disease of Sitka spruce were examined during a tour of parts of Scotland made with Mr. T. R. Peace of the Forestry Commission Research Station, and some joint work on this problem will be undertaken. There is frequently a quite clear association between bad physical soil conditions and the death of roots, and in the obvious cases, bad drainage is plainly the cause of trouble. There are, however,

instances of trees dying where there is no very obvious physical or chemical cause and it is hoped to investigate these further.

A research student, Mr. Hasan, carried out an investigation into the cause of butt-rot and root disease in Sitka spruce in Bagley Wood. These trees grow on a shallow gravelly soil with strongly impeded drainage in the subsoil. The fungi causing butt-rot are *Sparassis crispa* and *Polyporus Schweinitzii*; *Fomes annosus* was also isolated and *Armillaria mellea* has been known to occur on some of the trees in past years. Two interesting points arose out of this investigation. Firstly, necrotic areas occurred on roots in the subsoil and much resin flow associated with die-back of the root cortex was usually associated with these. Further, the wood of the roots so affected showed zones of abnormal parenchyma, which is taken to indicate the occurrence of unfavourable conditions for root growth in the water-air balance in the soil as the fundamental condition determining the root disease. The second point of interest is that, in attempting to prove by means of samples taken with a Pressler borer, the presence or absence of butt-rot in the plot of Sitka spruce under investigation, Mr. Hasan showed that the inner wood of the main stem of these trees even if not affected by butt-rotting fungi, is colonised by fungi some of which, at least, are associated with the development of blue-stain. The trees are not infested by beetles and it is not known how their stems became infected.

(b) *The silviculture and pathology of European larch.*

1. Twelve lots of European larch grown from seed collected in different places in Scotland, were tested in the refrigerator for frost susceptibility and it was found that highly significant differences occur between them. Their susceptibility to irreversible plasmolysis also showed significant differences though it has not been possible so far to correlate this with susceptibility to frost injury. Both these results show, however, that European larch, as grown in Scotland, is of very mixed character and suggest that some types will be found to be much superior to others for growth in Britain. It is of interest to note that trees raised from seed collected at the same place as that from which the most susceptible of the strains came from, has proved to be unsatisfactory in two places in Scotland and one in Wales.

2. The survey of European larch plantations in Coed-y-Brenin, by Mr. R. D. Pinchin, of the Forestry Commission Research staff, has been checked and extended this year yielding further data on the influence of soil conditions and local climate in relation to topography, on the occurrence of disease in, and the growth of, European larch. Attempts to isolate whatever organisms are present in the Spring in newly dying tissue in larch cankers give strong evidence that the initial killing factor is frost, at least in this forest, and not the larch canker fungus.

Mr. Sahni has been doing research work on the systematy and pathology of the larch canker fungus as a B.Sc. student.

3. With the kind co-operation of the Forestry Commission, and in particular with the valuable help of Mr. J. A. B. Macdonald, Silviculturist (North), a month was spent in May and June 1948 revisiting European larch plantations and generally making a final re-survey of their condition before embarking on the writing of the bulletin on the silviculture and pathology of larch, which is in course of preparation.

(c) *Bark necrosis and canker on the main stem of Conifers in the pole stage.* A considerable amount of work is in progress in the examination of the anatomical evidence of the manner of development of this phenomenon. So far really serious cases have been very restricted so that the economic loss caused has not been very great.

A report was submitted to the Forestry Commission on the Norway spruce at Drummond Hill, affected by this disease.

These conclusions in diagnosis plainly show the need for much careful work in the future, both to determine accurately the true value of the strains of spruce we are growing in this country and to search for others which are better suited to our climate and so will produce better qualities of timber.

Other items: A visit was paid to Holland in the spring of 1948 and during this time a week-end was spent with Dr. H. van Vloten at the Forest Research Station, Wageningen and in visiting the 'Willie Commelin' laboratory at Baarn, under Professor Westerdijk. The emphasis in pathological research is slightly different in Holland, parasitic factors being stressed, whereas here, considerable stress has always been laid on the non-parasitic factors in certain types of disease. This difference produced interesting discussions and valuable interchanges of ideas. Illustrated notes demonstrating the evidence for frost injury in the die-back of Corsican pine and in poplar canker have been sent to Wageningen as a result of this. The note on poplar canker will be published in Holland during the coming year.

FOREST ENTOMOLOGY

Dr. R. N. Chrystal continued in charge of the Section with Mr. E. R. Skinner as his assistant.

In addition to the normal course of instruction at the Institute, instruction in forest entomology was also continued at the Forestry Commission's foresters' schools. Three of these are now in operation, Parkend (Forest of Dean), Lynford Hall (Norfolk), and Capel Curig (North Wales). Two teaching periods have been given at each school during the year, during University Vacations. The standard attained, as shown by the final examinations, has been very satisfactory. In addition, a class from Mr. C. P. Ackers' training course at Huntley, Glos, received a short course at Parkend in June. The students of the forestry department Bangor University, North Wales, were given two short laboratory and field demonstrations.

The Douglas fir Adelges. Investigations on this insect were continued during the year. The Adelges population at Tubney and

in the areas under study in North Wales, again showed a low level. This was particularly noticeable in those closely foliated trees in which, normally, the density of the *sistens* population is very heavy, while the production of a stem-mother population during midsummer was low. The population on trees with open foliage was negligible.

In the experimental plots at Kennington, selected trees which had been subjected to artificial infection during 1947 were kept under observation. The needle recovery of these trees is apparently complete, while the vigour of shoot growth compared favourably with controls, the production of late-summer (Lammas) shoots being equally vigorous. The trees which lost up to 50 per cent of their foliage in 1947, and in some instances were heavily infested, have also recovered, and are showing satisfactory growth.

Population studies have been made in individual trees selected from the experiments laid down in 1947; a whole tree was examined, needle by needle to determine the position of the *sistens*. It was found that there was a distinct concentration in the inner parts of the lowest branches, the central core of the middle branches, and on a few upper shoots which had sufficiently dense foliage. The tree appeared to possess in itself the conditions which are found in plantations in the thicket stage.

Pruning experiment in young plantation. During 1947, arrangements were made with the Forestry Commission to carry out pruning in two young plantations at Ffrid Goch, Coed-y-Brenin forest, North Wales. These plantations are situated on an exposed hillside, and the trees range from 15 to 18 feet in height. In each plantation, two strips, each approximating three-quarters of an acre in area, were pruned up to a height of six feet removing about thirty per cent of the total foliage. These areas were flanked each side by unpruned trees. Pruning was carried out during the winter, and examination towards the end of this year's growing season showed no obvious ill effect from the operation. The height and growth vigour of the pruned trees compared favourably with that of the unpruned trees. At present, so far as the overwintering population of the *Adelges* is concerned, the relatively light attack makes comparative observation hard to assess. There has, however, been no concentration of the insects on the lowest branches of the pruned trees as had been thought possible at one time. Individual pruned trees at Tubney show a similar condition.

Conditions affecting Adelges concentration. Observations at Tubney made on trees of varying densities of foliage suggested that conditions of light and shade might be considered as a factor in determining the pattern of settlement of the *sistens* population. It is believed that within broad limits, light conditions, probably coupled with temperature, play a part in influencing the *Adelges* to settle in particular zones of the tree. At Tubney, light meter readings taken on individual trees, on both open and closed foliage, showed that there was a distinction between the zones favoured by the *sistens*,

and those where the population was negligible. Readings taken under canopy in the Ffrid Goch experiment showed that the pruning of the lower branches raised the light intensity at ground level 4.5 times over that recorded under the same conditions in the unpruned areas.

Other items.

At the request of the Forestry Commission, Education Branch, exhibitions were staged at the larger agricultural shows. With a view to replenishing the entomological teaching and permanent exhibition collections a start has been made this season, the response from foresters and others being most encouraging. This work has brought to light some interesting material, e.g., *Myelophilus minor* Hart., the Lesser Pine-shoot beetle, newly recorded as a breeding species in the New Forest. The spruce bark-beetle, *Polygraphus polygraphus* found breeding at Lynford, Norfolk, another spruce bark-beetle, *Dryocoetes autographus* from North Wales, and *Polygraphus* with *Pityogenes chalcographus* taken in imported timber at Maidstone, Kent. The alder woodwasp, *Xiphydria camelus* together with parasites is recorded from Lynford, Norfolk.

MENSURATION AND MANAGEMENT

Dr. Anderson was in charge of the general mensuration teaching work in connection with which sample plots in oak and Douglas fir were thinned and measured in Bagley Wood.

Mr. Dimbleby in collaboration with Mr. Robbins, acting Reader in Surveying, gave a course in aerial photographic survey to the senior students.

Mr. Brasnett gave the normal courses of instruction in management and a special short course in Colonial Forest Management. Practical work and the preparation of working plans was organised and supervised jointly by Mr. Brasnett and Dr. Anderson, in High Meadow Woods. A field exercise in mensuration and management including a comparison of the results obtained with varying intensities of enumeration and different methods of estimating yield was undertaken by the senior students in the same area. Dr. Anderson has made considerable progress on the stockmapping of Wytham and Bagley Woods for the preparation of the working plans.

STATISTICAL SECTION

This has continued under Mr. Day's direction. Miss Smith is progressing satisfactorily in her work as computer. There has been a very great increase in the use of statistical method on the part of students carrying out research for special subjects, or for a post graduate degree, and her services have been of great use in connection with this.

The help of the Lecturer in the Design and Analysis of Scientific Experiment has been of very great assistance in connection with this increased use of statistical method. Experience is showing that

adequately critical and reliable guidance in this can only be given to students by someone, such as the Lecturer, who is singly devoted to its practice and development.

The demand for the use of calculating machines has greatly increased. A new hand operated machine has been bought and it is hoped to obtain a second electrically operated one.

WOOD STRUCTURE

Dr. L. Chalk continued in charge of the section, with Mr. A. A. Shaw as senior assistant. Mr. P. Franklin, junior assistant, left during the year to do his Service training in the R.A.F.

The usual undergraduate and post-graduate courses were given, but the large numbers in the classes made it necessary to repeat laboratory periods two, and even three, times, owing to limitations of material and accommodation.

Apart from teaching, Dr. Chalk was engaged mainly on completing the book on systematic anatomy to which reference has been made in previous reports. The typescript was completed and it is expected that the book will be published early in 1949.

The principal additions to the wood collection were received from the Division of Forest Products, Council for Scientific and Industrial Research, Australia (through the Royal Botanic Gardens, Kew), the Forest Products Research Laboratory, Princes Risborough, the Conservator of Forests, North Borneo (through Mr. G. S. Brown), the Chief Conservator of Forests, Nigeria, Mr. A. C. Hoyle, and Mr. J. P. M. Brenan.

FOREST ECONOMICS

As in the previous year Mr. J. J. MacGregor gave an introductory course of lectures on general economic theory followed by one on forest economics. A special course on current forest economic problems was given to the Indian graduate students.

Reports on the economic history of the woodlands on three private estates have been prepared and it is hoped to publish these in the near future with the consent of the owners.

The Forest Economist continued to serve on the Oxon and Bucks Divisional Committee of the Royal English Forest Society. The Costings Committee of the Society, for which he acted as Secretary, published its provisional recommendations and these are being tried out in a limited way before further action is taken. When a costings basis is finally agreed, it is hoped that a more regular flow of economic data on a standardised basis will be obtained from private estates.

A talk on Timber Prices and Supplies was given at the Refresher Course for land owners and agents which is held annually at the Royal Agricultural College at Cirencester.

FOREST LAW, LAND TENURE AND TAXATION

For the second year, a course was given by Mr. J. J. MacGregor on the British aspects of these subjects which form an optional subject in the Honours School. A very short course on law topics for Colonial Forest Officers was tried out, and its development is under consideration.

COLONIAL FOREST ADMINISTRATION

Mr. N. V. Brasnett gave a course in this subject which is an optional one in the Honours School, but is taken by all Colonial Officers and Probationers. As no students reading for the Final School were offering the subject during the year greater freedom than usual was possible in dealing with the syllabus, some of which was taken on a seminar basis. One officer made a special study of colonial forest law.

FOREST ENGINEERING AND UTILISATION

In addition to the normal degree courses by Colonel A. H. Lloyd, road alignment work was carried out in the field (at Wytham) and visits were paid to new road construction and metalling by arrangement with the Oxfordshire County Surveyor. Lectures were also given to Colonial Probationers and Officers, and to Indian Forest Officers, on modern methods of timber felling, extraction, transport and saw-milling.

The usual ten-day course at the Forest Products Research Laboratory was held in December for Forest Officers and Probationers, and for senior students. Lectures and demonstrations were given in sawing and wood-working machinery, in kiln drying, wood bending, timber mechanics, wood preservation, and wood chemistry. Thanks are due to the Director and to Mr. C. W. Scott for arranging the course, and to the staff of the Laboratory who assisted. The Laboratory was also visited by the Indian Officers during their course.

At the request of the Uganda Forest Department, arrangements were made with Messrs. Spears and Jackson Ltd., at Sheffield, for special instruction to two officers, on the care and maintenance of pit-saws, and the manufacture and design of these saws. A junior Forest Officer from Cyprus deputed for a special two-year course in Forest Engineering, continued his studies in saw-milling, in building construction, and in pumping plant and other machinery, at Birmingham and other engineering centres.

A special fifteen days' tour was conducted this year to Italy for Indian Forest Officers for the study of counter-erosion work and torrent training in the Alps. The party was given excellent facilities to see counter-erosion works under present construction, and also to study the effects of thirty years of torrent-bed training, and the control of floods and avalanches.

Twenty-eight technical inquiries on Forest Engineering from outside sources were dealt with during the year.

Lectures were given in minor forest products, and a visit was paid to the Imperial Institute, London, where demonstrations were given of the research now in progress in these products.

The handling and saw-milling of imported hardwoods was seen at Messrs. Gliksten's Sawmills at Stratford, and a discussion was held on the marketing problems of newly introduced tropical timbers. The use of timber in the construction of railway coaches and other rolling-stock was studied at the British Railways centre at Swindon, where kiln and air seasoning of imported timbers was also seen.

A new type of high-lead skidder combined with the normal gravity extraction of timber by cable in mountainous country was studied in Switzerland and a demonstration was given to final-year students.

FOREST PROTECTION

Lectures were given to first year students by Colonel A. H. Lloyd covering fire protection, soil erosion, and methods of protection of mountain slopes and torrent beds.

SURVEYING

Mr. A. R. Robbins, the acting Reader in Surveying, gave the regular course in Surveying in the Michaelmas Term, and repeated it in Trinity Term for the benefit of ex-Service students.

LIBRARY

Comparative statistics show, in all respects but one, considerable increase in the number of accessions and of loans over the previous year. The sole decrease, that in loans to students, may be ascribed to increased library seating and to the resumption of evening sessions during term.

<i>Accessions:</i>	Total 2,901 (increase, 525)
Issues of periodicals	1,553 (" 246)
Books	126 (" 38)
Other items	1,222 (" 241)

NOTE: The Commonwealth Forestry Bureau provided 255 items, the British Council 27, 188 were obtained by request from other institutions, 10 of the books were gifts and 3 books were purchased with the Brooks Memorial Fund.

<i>Loans:</i>	Total 5,755 (increase, 883)
To staff	2,482 (" 424)
To the Bureau	905 (" 49)
To students	1,637 (decrease, 18)
To visitors and correspondents	731 (increase, 392)

New periodicals: 18 new titles were added from Denmark (2), Finland (2), Great Britain (2), United States (2), Austria, Canada, Holland, International, Palestine, Poland, Rumania, Spain, Turkey and Yugoslavia (1 each).

New Series other than periodicals: 49.

Letters and Sales: Letters received, 932: letters sent (mainly requests either for material or for information to be embodied in our forthcoming printed list of Periodicals and Series), 1,541. The sale of publications, for a short time taken over by the Office, but now resumed by the library staff, amounted to £85. Publications connected with the Empire Forestry Conference represent much of this unusually large sum.

In August (1947) Mr. Y. Smythies (M.A. Cantab.) was appointed Assistant Librarian and his former work of preparing for publication a list of periodicals and series held in the library was entrusted to a temporary assistant; this list, arranged both geographically and alphabetically, will be published shortly. It has involved an unexpectedly large amount of correspondence which has delayed the printing somewhat.

On account of pressure on floor space, it was found necessary to move the current catalogues to a room some distance from the library. Mr. E. F. Hemmings continued in charge of the catalogues which received their highest number of additional entries since the incorporation of the arrears, *viz.*, 3,998 to the author catalogue and 3,852 titles to the subject catalogue: altogether 14,584 cards were added. This increase has necessitated two complete respacings of the entire body of cards.

An author-index to references in periodicals and series published between 1900 and 1934 has been made to accompany the current (1935 onwards) index. Work on a new author-index to all books is now in progress.

A large quantity of duplicates was sorted and sent to the Book Centre at the National Central Library, London, for distribution to war-damaged libraries abroad. There are still a good many duplicates awaiting similar attention.

Further efforts were made to obtain recent German periodicals and books, with moderate success; many gaps remain. Interchange with other foreign countries, though in some cases fitful, has on the whole been well maintained.

Donors to the Library, those who give regularly each year as well as new donors, are cordially thanked. Mention may be made of Mr. L. V. Burns (Jamaica); Mr. O. P. Bhargava (Gwalior); Dr. Paulo Ferreira de Souza (Brazil); Mr. R. St. Barbe Baker; Mr. A. J. Robertson; Dr. H. E. Desch; Dr. R. Gurney; Professor T. G. B. Osborn; Dr. J. L. Harley; Dr. E. W. Jones; Colonel A. H. Lloyd; the Director of the Forest Products Research Laboratory; the Superintendent of Rhodes House Library; the British Council, and the American Tree Association. Many institutions both of the Empire and of foreign countries presented publications in answer to inquiries and their generous response is much appreciated.

FINANCE

The audited accounts of the Department will be published in the *Oxford University Gazette*. The following is a summary of income and expenditure for the year.

GENERAL ACCOUNT

Income. Forestry Commission, £8,163; Colonies, £7,603; Colonial Development and Welfare Fund, £6,992; Curators of the University Chest, £200; Dominions, India and others, £1,100; other receipts, £448. Total Income, £24,506.

Expenditure. Staff salaries and pension contributions, £15,998; Instructional supplies, £2,028; Furniture, £69; Travelling, £1,829; Administrative and miscellaneous expenses, £2,421; Repayment of loan and interest to Capital Account, £1,987. Total Expenditure, £24,332.

In addition to the above expenditure, the University has paid, on behalf of the Department, the sum of £8,394 on Staff Salaries and Pension Contributions.

APPENDIX I

PUBLICATIONS

H. G. CHAMPION:

GENERAL

Afforestation as a World Problem. Address to the Royal Society of Arts, March 17, 1948. *J. R. Soc. Arts*, 96 (4771), 1948, 430-9.

Scandinavian Forestry, IV: Denmark, *Emp. For. Review*, Vol. 27 (1), 1948, 54-7 and 4 photos.

Reviews:

Papers on genetics submitted to the Fifth Empire Forestry Conference, 1947:

Field Trials of Geographical Races of *Pinus Pinaster* in South Africa by H. B. Rycroft and C. L. Wicht,

The Potentialities of Genetic Research in South African Forestry by S. P. Sherry,

Forest Tree Breeding in Canada, by J. L. Farrar,
Emp. For. Rev. Vol. 27 (1), 1948, 121-122.

The Climatological Basis of Forestry, New South Wales, Part I by W. A. W. de Beuzeville (*For. Comm. Bull.* 1947).

The Climatology of the Introduction of Pines of the Mediterranean Environment to Australia, by J. A. Prescott and C. E. Lane-Poole, (*Trans. Roy. Soc. S. Austr.* 71(1) 25th July, 1947),
Emp. For. Rev. Vol. 27 (1), 1948, 121-122.

Our Forests, by W. H. Rowe (London, Faber and Faber), 1947
Nature, July 26, 1947, p. 106.

The Future of the New Forest: on the 'Forestry Comm. Report of the New Forest Committee, 1947,' (Cmd. 7245)
Nature, April 10, 1948, 547-548.

Preservation of the kauri in New Zealand: on conclusions reached by Professor V. J. Chapman in a series of newspaper articles in New Zealand,
Nature, January 10, 1948, 72-73.

E. W. JONES:

SILVICULTURE

Scots Pine regeneration in a New Forest Inclosure (*Pinus sylvestris* L.), *Forestry*, 21 (2), 1947, 151-78, 4 refs. Smry. 6 gphs. 21 tbls. 2 maps.

G. W. DIMBLEBY:

ECOLOGY

Review:

Forest Site Types of the Pacific North-West. A preliminary Report, by R. H. Spilsbury and D. S. Smith (Department of Lands and Forests, B.C.F.S.)

Emp. For. Rev. Vol. 27 (1), 1948, 142-143.

L. LEYTON:

Mineral nutrient relationship of forest trees, *Forestry Abstracts*, Vol. 9/4, June, 1948, 399-408.

FOREST BOTANY

A. C. HOYLE:

Tropical Soil-Vegetation Catenas and mosaics, in collaboration with Mr. Morison and Dr. Hope-Simpson, *Journal of Ecology*, July, 1948.

J. P. M. BRENNAN:

Empogona Hook. f. and its relation to *Tricalysia* DC. *Kew Bull.* No. 1, 1947, 53-63.

Mansonia dialomanthera Brennan, *Ellipanthus hemandradenioides* Brennan, Hook. *Icones Plantarum*, t. 3451-2.

J. P. M. BRENNAN:

With Mr. A. C. Hoyle: New or noteworthy plants from West Tropical Africa, *Kew Bull.* No. 1, 1947, 67-74.

FOREST PATHOLOGY

W. R. DAY:

Soil Selection and Forestry, *Farming*, 1948, 18-23.

The penetration of Conifer Roots by *Fomes annosus*, *Quart. Journ. Forestry*, April, 1948.

Reports:

Preliminary Note on the development of cankers on stems of trees in the Norway Spruce live pruning experiment, Drummond Hill Forest, January, 1948.

Canker development in Poplars and Willows, pp. 1-4 with 9 photos. Symptoms of Frost injury in Corsican pine stems, pp. 1-3 with 22 photos.

Heart Rot in the Forest of Dean.

FOREST MENSURATION

M. L. ANDERSON:

Impressions of Forestry in Finland, *Emp. For. Rev.* Vol. 27 (1), 1948.

Review:

Forestry and Woodland Life by H. L. Edlin, *Forestry*, Vol. XXI, 1947.

FOREST MANAGEMENT

N. V. BRASNETT:

Working Plans, *Emp. For. Rev.* Vol. 26 (2), 1947, 253-255.

Reviews:

Papers submitted to the Empire Forestry Conference 1947, on Land Utilisation,

Emp. For. Rev. Vol. 27 (1) 1948, 83-90.

Administration Reports, etc:

Tanganyika Territory, 1944, Uganda, 1946,

Emp. For. Rev. Vol. 26 (2), 1947, 325-327.

Northern Rhodesia, 1946, Report of the Games and Forest Reserves Commission, Nyasaland,

Emp. For. Rev. Vol. 27 (1), 1948, 175-178 and 137-139

FOREST ECONOMICS

J. J. MACGREGOR:

World Timber: Problems, Resources and Trade, *Wood*, September, 1947, 258-261.

The Dedication Scheme for Private Woodlands. Accepted by the Journal of the Royal Agricultural Society for England.

A problem of Forest Finance, Leading article in *Empire Forestry Review*, Vol. 27 (1), 1948, 22-26.

Work Simplification, *Jn. of Oxford Univ. For. Soc.* 3rd Series, No. 2, 1947, 7-14.

Timber Supplies and Prices in Recent years and future prospects. Accepted by *Journ. of the Royal Forestry Society of England and Wales*.

Report:

Land Tenure in England and Wales (A report prepared for the Food and Agriculture Organisation as part of a reconnaissance survey of some selected countries).

Reviews:

Forest Valuation, with special emphasis on Basic Economic Principles, by Professor H. H. Chapman and W. H. Meyer, *Nature*, May, 1948.

ditto, *Science Progress*, August, 1948.

Papers read at the Fifth Empire Forestry Conference, 1947:

(A) Timber, Plywood and Veneers by B. S. Chengapa,

(B) Minor Forest Products by S. Krishna and R. L. Badhwar,

(C) Cellulose and Paper by M. P. Bhargava,

Post-War Timber Supply in Australia and its effect on Forest Utilisation by L. S. Hudson, The National Forest Survey in New Zealand by A. P. Thompson,

Emp. For. Rev. Vol. 27 (1), 1948, 91-97.

FOREST UTILISATION

A. H. LLOYD:

Forestry Developments in Great Britain, the Commonwealth and Europe—article in *Encyclopaedia Britannica* 'Book of the Year' for 1947/8.

APPENDIX II

STAFF

I. STAFF ENGAGED IN INSTRUCTION AND RESEARCH

PROFESSOR H. G. CHAMPION, C.I.E., M.A. (Oxon). Tropical Forestry, Forest Policy.

*L. CHALK, M.A., D.Phil (Oxon). Wood Structure and Properties.

*W. R. DAY, M.A., B.Sc. (Oxon). Pathology, Forest Hygiene.

*A. H. LLOYD, O.B.E., M.C., T.D., M.A., (Oxon). Forest Engineering and Utilisation.

*†R. N. CHRYSAL, D.Sc. (Edin.), Hon. M.A. (Oxon). Forest Zoology.

*‡N. V. BRASNETT, M.A., Dip. For. (Cantab.). Forest Management.

*¶M. L. ANDERSON, M.C., M.A. (Oxon), D.Sc. (Edin.). Mensuration.

*J. J. MACGREGOR, B.Sc. (Glasgow), M.S. (Wisc.), B.Litt. (Oxon). Forest Economics.

*§E. W. JONES, M.A. (Oxon), Ph.D. (Cantab.). Silviculture.

*W. R. C. HANDLEY, M.A. (Oxon), Ph.D. (Leeds). Microbiology.

*L. LEYTON, M.A. (Oxon), Ph.D. (Leeds). Tree Physiology.

*G. W. DIMBLEBY, M.A., B.Sc. (Oxon). Forest Ecology.

*J. P. M. BRENNAN, M.A. (Oxon). Tropical Forest Botany.

||P. J. RENNIE, B.Sc. (Lond.). Soil Research.

||P. E. W. MURPHY, B. Agr. Sci. (Dublin). Soil Research.

II. STAFF OF OTHER UNIVERSITY DEPARTMENTS ASSISTING IN INSTRUCTIONAL WORK

A. C. HOYLE, M.A., B.Sc. (Oxon). Forest Botany and Ecology.

C. G. T. MORISON, M.A. (Oxon). Soil Science.

G. R. CLARKE, M.A., B.Sc. (Oxon). Soil Science.

A. R. ROBBINS, M.A. (Oxon). Surveying.

D. J. FINNEY, M.A. (Oxon), M.A. (Cantab.). Statistical Methods.

III. OTHER STAFF

Secretary: Miss H. M. EDWARDS.

Assistant Secretary: Miss I. BLAGROVE.

Accountant: Mr. A. A. ADAMS.

Librarian: Miss G. GUINEY.

Assistant Librarian: Mr. Y. SMYTHIES, M.A. (Cantab.).

* These members of the Staff have the status of University Demonstrators (Forestry).

† Dr. R. N. Chrysal reappointed from 1.8.46 for five years.

‡ Mr. N. V. Brasnett for two years from 1.10.48.

§ Dr. E. W. Jones from 1.8.45.

¶ These members of the Staff were appointed for three years from 1.4.47.

|| Dr. Anderson appointed for five years from 1.12.46.

